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AN EVALUATION OF THE MONETARY TRANSMISSION MECHANISMS IN SOUTH AFRICA

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ABSTRACT

The aim of this paper is to see whether the adoption of the Inflation Targeting regime has had an impact on the Monetary Transmission Mechanisms in South Africa. I employ a reduced-form VAR model to test the strength of the Monetary Transmission Mechanisms during two distinctly different monetary policy regimes. I investigate the strength of the various transmission channels during the Monetary Targeting regime using data from 1986-1999 and the Inflation Targeting regime using data from 2000-2010. The empirical results indicate that the transmission mechanisms are stronger during the Inflation Targeting regime.

I would like to express my sincerest gratitude to Dr. Mark Ellyne from the University of Cape Town. Thank you for contributing immensely to this paper and to the wealth of my knowledge on this topic.
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1. INTRODUCTION

This paper examines the monetary transmission channels in South Africa. I also look at whether the adoption of an Inflation Targeting regime has changed the monetary transmission mechanisms South Africa. Although a lot of literature on this topic is available, very little empirical research has been done on the various transmission channels of monetary policy in South Africa. The most popular paper that did extensive work on this topic was published in 2001, written by Small and de Jager. At the time the inflation targeting regime had only been in place for just over a year. Thus it will be interesting to look at whether the transmission mechanisms have changed since then.

Monetary policy works through a complex and elongated series of steps that are described by the monetary transmission mechanism. "The monetary transmission mechanism is a description of how policy-induced changes in the nominal stock or the short-term nominal interest impact on real variables such as aggregate output and employment" (Ireland: 2005). The sequence of events starts with the initial influence on interest rates, exchange rates, equity prices and credit levels. Changes in these variables start to slowly work through changes in consumption and investment levels, which influence domestic demand. Changes in domestic demand impact aggregate output, wages and the level of employment. Ultimately a change in the real variables leads to a change in domestic prices i.e. inflation. The monetary transmission mechanism is also concerned about how long it takes for monetary policy decisions to have an effect on the real economy, how strong the impacts are, and whether the results achieved are the intended results.

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The primary policy objective of most monetary policies run by central banks is to achieve and maintain domestic prices and financial market stability, however the country defines it. To that end, central banks usually chose a nominal anchor for their monetary policy, which might be pegging their exchange rate or targeting the growth of a monetary aggregate. There are also purely discretionary monetary policy regimes without any stated nominal anchor. Monetary policies frequently have secondary objectives for growth or employment, but this is usually not their primary objective.

Among the various monetary policy regimes being used today, inflation targeting (IT) has become increasingly popular, especially amongst advanced economies. In the IT regime,

inflation is seen as the nominal anchor and interest rates are the operational policy variable. The IT regimes can vary from very strict rules about how the interest rate should behave to more discretionary rules.

From the mid-1980s until now, South Africa has experienced two broad monetary policies. (Veller & Ellyne: 2011). From 1986 to 1999, the SARB's monetary policy objective was to target the money supply. During this regime, in the first quarter of each year the SARB announced targets for a broad definition of money (M3). The targets were put in place with the aim to protect the internal and external value of the Rand. In February of 2000 The South African Reserve Bank (SARB) adopted an inflation targeting regime, which is still the monetary framework used today. The bank's objective is to protect the value of the currency so that it can help the economy achieve balanced and sustainable economic growth over the long run. The SARB's main objective now is to keep the inflation rate in South Africa within a bandwidth of 3% -6%. In both regimes the main policy tool used is the Repurchase (repo) interest rate that the SARB charges to commercial banks.

The success of monetary policy depends on its ability to influence real variables. However, over time output and prices may become immune to monetary policy shocks. When real variables not longer react to monetary policy as expected, it raises questions of whether the monetary policy transmission mechanism has changed. There are many factors that may alter the effectiveness of monetary transmission mechanisms. "Firms and consumers may have changed their behaviour and the organization of markets in a way that has reduced the effect of given shocks on output and inflation" (Boivin & Giannoni, 2002). Another reason may be that, monetary policy is conducted in a manner that is more responsive to fluctuations in output and inflation. This new conduct may reduce the impact that monetary shocks may have had on inflation and output (Clarida, Galf and Gertler, 2000).

In South Africa the transmission mechanism is affected by many factors. In the early 1990s the capital market was liberalised and exchange rate controls were dropped.
More than 50 foreign banks started to operate in South Africa and more people, who previously had not banked were absorbed into the market economy.

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The changing world conditions distorted the complex monetary policy transmission mechanism and made the SARB's pursuance of price stability more difficult. (Smal and de Jager, 2000). The relationship between monetary policy variables and the real economy variables became obscure. " This had the ultimate effect that longer time lags had become discernible between the policy change and its desired impact on the real economy and inflation" (Smal and de Jager, 2000).

In their paper, Small and De Jager (2001) found that for the South African economy, an increase in interest rates will initially lower consumption and investment expenditure and therefore output. They also found that a rising repo rate, changes the interest rate parity differential between domestic and foreign interest rates and this serves as a means to attract foreign funds. In turn the capital flows cause the exchange rate to appreciate. I find similar result in their paper. My results differ from theirs in that, the VAR that I estimated for the period (2000-2010) reflects that the current transmission mechanism that has short time lags, whereas they found that there are long time lags between a change in interest rates and the impact on the real economy.

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2. THE EVOLUTION OF MONETARY POLICY IN SOUTH AFRICA

The South African economy has gone through several monetary policy phases that have ranged from controlling the money supply to stabilizing interest rates and the exchange rate. The De Kock commission clearly outlined the several different monetary policy phases of the South African economy since World War II (Mollentze, 2000). In this section I summarise the different monetary policy regimes in South Africa from 1965 to the present.

The monetary policy phase between 1965 and 1980 represents a period in which non-market or "direct" monetary controls were used. Fiscal policy was mainly used in the pursuance of macroeconomic objectives and monetary policy had a supportive role to play.

Monetary policy was used as an instrument to implement a counter cyclical monetary policy. During this period monetary authorities did not believe in the importance of money supply and the efficiency of interest rates.

By the late 1960s South Africa was using direct controls such as credit ceilings in efforts to reduce the propensity of consumers to spend. Other monetary controls included; the deposit rate, exchange rate, hire purchase and consumer credit controls.

This policy model started to fail because the need to manage public debt and to finance the budget deficit obstructed the objectives of the monetary policy. Market related controls were hardly ever used, so policy variables like the interest rate hardly changed. Of course the root of the problem was the fact that the South African financial markets were underdeveloped. At the same time there were irregular crises in the world's financial markets, which resulted in the realignment of currencies in 1971 and the collapse of the Bretton Woods system. Post this policy, South Africa tried to implement various interest rate linkages. In 1979 monetary authorities introduced a controlled-floating exchange rate system.

The next Phase which took place from 1980 to 1985 was a transition from direct controls to market related controls. The 1980's represented a period of major changes in the monetary policy of most countries. The management of demand controls employed in the previous phase resulted in more instability in the financial markets and the economy. Monetary authorities began to pursue policies that allowed the interest rates to vary with the forces of demand and supply. The only problem with the new policy was that the objectives of the monetary authorities were not transparent. "They failed to publish the details of their intermediate targets pertaining to the growth of the money supply (Mollentze, 2000). The reserve bank governor at the time, Dr De Kock meant to apply the market orientated policies with a great deal of discretion and flexibility but this came under a lot of criticism.

In 1986 a Money Supply Targeting regime was introduced. During this regime monetary authorities set targets for the growth of broad money, and these targets were announced in the first quarter of each year. The targets were used as guidelines and the SARB could breach them without having to explain why (Aron and Muellbauer, 2007). The policy tool

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employed in this regime was the repo rate, which the SARB used to control overnight lending to commercial banks and short-term market interest rates.

The objective of the SARB was to protect the internal and external value of the Rand. This objective did not imply that the SARB was resolute in its policy objectives. The SARB also took into account the fiscal objectives of the government, such as the need to stimulate economic growth, to create employment and to improve the living standards of South African citizens (Smal et al., 2001). The commissioner of the SARB at the time, Dr Stals expressed that the only way South Africa could achieve its potential economic development, is if the financial environment was stable. The De Kock report stated that, although increases in demand stimulate growth in the short-run, in the long-run higher rates of inflation will impede real output growth. "Balance of payments objectives, growth and employment can best be supported by maintaining a climate of reasonable domestic price stability" (Smal et al., 2001)

The liberalization of South Africa's financial markets resulted in many foreign banks coming into South Africa, which significantly increased the amount of funds available to issue as credit. Over and above this, more previously unbanked people were being absorbed into the economy. Both these factors caused the demand for credit in South Africa to be less sensitive to interest rate changes. The large volume of transactions in the financial markets made the relationship between the money supply and price changes weaker. Therefore the overall interest rate elasticity of expenditure fell quite dramatically. "As international capital flows and developments in domestic financial markets began to obscure the transmission mechanism of monetary policy, it became apparent that the change in the money supply had become a less reliable indicator of underlying inflation, and therefore also a less reliable anchor for monetary policy." (Smal et al., 2001) These changes in the monetary transmission mechanism affected the credibility of the money supply as a nominal anchor.

At this point, the SARB started to shy away from targeting the money supply to employing a range of economic indicators to determine their policy action. In 1998 Dr. Stals suggested that South Africa should gradually move towards a monetary policy of Inflation Targeting. At this time many countries, with New Zealand being the first had shifted their monetary policy frameworks towards targeting the inflation, the ultimate goal obviously being to keep inflation as low as possible.

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On the 23rd of February 2000, the minister of finance announced that the South African government had decided to implement Inflation Targeting as the new monetary policy framework. The decision was to set a target range of between three and six percent in the year 2002. The policy main objective of the SARB did not change. The SARB aimed to protect the value of the currency so that it could continue to pursue economic growth that is balanced and sustainable.

The SARB achieves financial stability by influencing the money supply and bank credit extension. They can do this in two ways; either by influencing the supply of money or the demand for credit from the private sector. The money supply can be influenced with operational instruments such as the minimum cash reserves for banking institutions, open-market operations and short-term money market interventions through swaps and repurchase transactions. (Mboweni, 2000). The demand for credit is managed by influencing the level of interest rates. In this case, the repo is used as the operational instrument. The Inflation Targeting regime has made the monetary policy in South Africa more transparent. There are many communication channels between the SARB and the greater public.

Another approach developed by the National Treasury, to be implemented by the SARB, is to adopt the new Macroprudential approach. This approach arose due to a need to manage system-wide risk across the entire financial sector as a response to the aftermath of the financial crisis. The Macroprudential approach entails the analysis of macroeconomic trends and how they interact with the potential soundness and stability of financial firms and the financial system. (National Treasury Policy Document, 2011)

On the downside, Inflation Targeting has received a lot of criticism. Labour organisations such as the Congress of South African Trade Unions (COSATU) argue that inflation targeting leads to an overemphasis on monetary stability at the cost of growth and development, and it reduces flexibility in dealing with exogenous shocks to the economy. This however is not entirely true. The concentration on achieving the inflation target does not imply that the SARB is not concerned with economic growth and employment. "A careful analysis is made of current and projected international and domestic economic conditions in the determination of the monetary policy stance." (Van der Merwe, 2004) However, the primary objective of the SARB is to influence interest rates so that thy can combat inflation.

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3. CHANNELS OF MONETARY TRANSMISSION

Following (Smal et al., 2001), I briefly describe some of the monetary transmission channels using the categories provided by Mishkin (1995). The broad categories are; the traditional interest rate channel, other asset price channels and the credit channels.

The description of the monetary transmission channels that follows here assumes that the central bank pursues an expansionary monetary policy by resetting the policy instrument.

2.1 The Interest Rate Channel

Short-term interest rates: A change in the repo rate is immediately transmitted to other short-term wholesale money-market rates and other short-term rates such as interbank deposits. Soon after a change in the repo rate, banks normally also adjust their lending rates by the same amount at the change in the repo rate. This immediately changes the rates at which banks lend their customers for variable-rate loans. Long-term interest rates: The effect of a change in the repo rate may have an ambiguous effect on long-term interest rates. The reason is that long-term rates are influenced by an average of current and expected future short-term rates. Therefore, the outcome of long-term interest rates depends on the direction and the magnitude of the repo rate change on the expectations of the future path of interest rates. The actual effect of the repo rate on long-term rates will partially depend on how the policy change will impact inflation expectations.

An expansionary monetary policy reduces the cost of capital. This causes both investment and consumption spending to rise. Increase in expenditure leads to an increase in aggregate demand and therefore an increases domestic prices and output. This channel therefore operates through businesses' and consumers' decisions because both groups spent on investment. Businesses invest in capital while consumers invest in housing and durable goods. According to (Mishkin: 1996), what is important about the interest rate channel is that it is the real rather than the nominal rates, and the long-term rather than the short-term rates that ultimately have an impact on the investment behavior of businesses and consumers.

The connection between the short nominal rates and the real long term rates that influence expenditure is best explained by (Mishkin: 1996). "The key is sticky prices, so that

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expansionary monetary policy which lowers the short term nominal interest also lowers the short-term real interest rate, and this would be true even in a world with rational expectations" (Mishkin: 1996). The expectations hypothesis of the term structure of interest rates, states that, the long interest rate is an average of future short interest rates, which explains how short rates ultimately influence factors that are only influenced by long term rates.

2.2 The Other Assets Price Channels

This channel explains how relative asset prices and wealth effects transmit monetary effects into the real economy. The two key assets that are extensively investigated are the foreign exchange and the equities.

3.2.1 The Exchange Rate Channel

This channel operates through monetary deposits and net exports. *Monetary Deposits:* when an expansionary monetary policy is implemented, deposits denominated in local-currency offer lower returns hence they become less attractive than their foreign denominated counterparts. As a result investors disinvest in local-currency denominated deposits, which cause the exchange rate to depreciate. *Net Exports*: a depreciated currency makes imports relatively expensive and makes exports relatively cheap, which increases net exports. An increase in net exports increases total output. A weaker exchange rate also makes foreign goods relatively more expensive, which means that inflation is imported through the purchase of these goods.

3.2.2 The Equity Price Channels

According to Mishkin (1996) there are two channels of the equity price mechanism that are important. The Tobin's Q theory of investment and the wealth effects on consumption. There is also a third channel called the Housing and Land Price Channels (See Mishkin, 1996). In this paper I only explain the *wealth effects* channel.

This channel operates through equity prices which occur through wealth effects on consumption. "A major component of wealth is common stocks" (Mishkin: 1996). When the monetary policy is relaxed, economic agents find that they have more money at their disposal.

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They may invest their in the stock market, which increases the demand for stocks and hence stock prices. When the values of stocks go up, it increases the lifetime resources of consumers and therefore a rise in consumption. Ultimately an increase in consumption will increase output and prices.

2.3 The Credit Channel

The credit channel can be split into two channels, namely the bank lending channel and the balance sheet of households and firms channel.

3.3.1 The Bank Lending Channel

When the monetary authorities decide to embark on an expansionary monetary policy, they increase the bank's reserves and deposits which in turn increase the amount of credit the banks can issue.

More credit in the hands of businesses and households will increase investment and consumption expenditure. In turn the Increase in expenditure will result in an increase in output.

According to (Mishkin: 1995) this channel is more important for small enterprises which depend on bank credit more that bigger corporations since they can raise funds in the capital and bond markets. Mishkin also mentions that on a global scale, banks are starting to play less of a role as lenders, which renders them small players in the credit markets and therefore making the bank lending channel a week one.

3.3.2 The Balance Sheet Channels

This channel can be broken further into smaller channels which are not discussed in this paper (See Mishkin 1996)

This channel is a combination of the household and the businesses balance sheet channel. This channel occurs due to asymmetric information in the credit markets, namely the adverse selection and moral hazard problem. The higher the net worth of households and businesses the less the severity of the adverse selection and moral hazard problem are in lending to these agents. Higher net worth means that borrowers have more collateral to secure their loans, therefore losses due to adverse selection that could accrue to banks are

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lower. A decline in the adverse selection problem means that the overall lending to businesses and households will rise which increases investment spending and hence output. A decrease in the interest rate will increase the households and businesses cash flows or collateral, which reduces the adverse selection and the moral hazard problem. This will result in more credit extended, which in urn will increase investment expenditure and finally cause a rise in output.

According to Mishkin, an important feature of this particular channel is, unlike the interest channel, it is actually the nominal interest rates that have an impact of cash flows "Furthermore, the short-term interest rate plays a special role on this transmission mechanism because it is interest payment in the short-term rather than long term debt that typically have the greatest impact on cash flow" (Mishkin: 1996)

2.4 Second Round Effects

Over and above the direct monetary transmission channels, there may be further effects on economic agents which were not directly affected by monetary policy change. For example other firms and individuals may be affected by changes in consumer spending or increased demand from other firms. These indirect effects can be anticipated by other agents in the economy, which means that there may be a large impact on expectations and confidence. For example upturns and downturn in the business cycle tend to reinforce the confidence and the cautious attitudes to spending by consumers and firms. "This means that the individuals and firms most directly affected by changes in the repo rate are not necessarily those most affected by its full repercussions" (The transmission mechanism of monetary policy, 1999)

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4. FACTORS THAT AFFECT THE MONETARY POLICY TRANSMISSION MECHANISM IN SOUTH AFRICA

South Africa is quite different from other economies in that it has quite a complex socio-political and economic history. As a result, there are many factors that affect the monetary policy transmission mechanism. These factors include socio-political goals, interest rate elasticity, expectations, changes in capital markets and time lags (Mollentze, 2000)

South Africa has changed quite significantly since the 1980s. It is now integrated into the world global markets, which it was excluded from prior to the mid-1980s. The fact that the economy is now operating in a totally different environment that it used to, means that the impact of monetary policy has also changed. The new government which came in place in 1994 still has many socio-political and economic goals that it would like to achieve. The government has to address socio-economic problems such as poverty, unemployment and try to achieve economic growth. Therefore, in South Africa there is increased pressure for monetary policy to address such problems. This is problematic because it is difficult for the SARB to achieve its mandate of achieving price stability while addressing these socio-economic problems as well. These socio-economic problems are one of the factors that impede on the efficiency of the monetary transmission mechanism in South Africa.

The liberalization of South Africa's financial markets caused the overall interest rate elasticity of expenditure to fall quite dramatically. Changes in interest rate elasticities have a large impact of the efficiency of the monetary transmission mechanism.

Expectations also play a role in how monetary decisions are transmitted into the real economy. South Africa's labour market is very rigid with regard to changes in wages. Prices in the economy, including wages can move up but they never move down.

This is an example of the rational expectations theory. The extent of price rigidities influences the transmission mechanism. Inflation expectations are another factor. If these cannot be anchored by the SARB, they may result in a case where efforts to curb inflation become unsuccessful. "All this ultimately affects simple market-related determination of variables and makes the transmission of monetary policy less effective." (Mollentze, 2000)

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The integration of South Africa into global financial markets implies that events that occur outside of South Africa have an effect on domestic markets. This can be illustrated by how rapidly the Johannesburg Stock Exchange reacts to events that occur in other countries. Today there are many financial markets operating in different economies and one can find many types of financial instruments, these factors also affect the efficiency of monetary policy.

South Africa is a middle income economy that has a sophisticated financial market and banking sector. In other economies, this attribute serves to speed up the reaction of intermediate and real variables to changes in the monetary policy. But South Africa is also a developing economy and it has many structural problems that industrialised economies do not have. This causes the monetary transmission to be less effective and to take time lags which would not occur otherwise.

Another factor that affects the transmission mechanisms in South Africa, is the emerging markets contagion effects. According to Pritsker, Contagion can be defined as an occurrence when a shock to one or a group of markets, countries, or institutions, spread to other markets, or countries or institutions. "Stock markets through out the world, and especially those in emerging markets, seem to be excessively correlated." (Rigobon, 2002) Contagion can occur via real sector linkages, financial sector linkages, financial institution linkages and interactions of financial institutions and financial markets.

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5. METHODOLOGY

I employ a reduced-form VAR model to asses the strength of the monetary transmission mechanism in South Africa. A VAR model is a reduced form dynamic system of equations, which describe the evolution of a set of endogenous variables over the same sample period as a linear function of their past evolution. VARs are important for this type of empirical work because the normal structural economic modeling approach in not very helpful, in that, the theoretical restrictions limit the interdependencies of the variables included in the model. According to (Poddar. et al: 2006) the VAR methodology allows researchers to use minimal restrictions on how monetary shocks affect the economy which works as a distinct advantage because the working of the monetary transmission mechanism lacks analytical work.

"In addition, this approach recognises explicitly the simultaneity between monetary policy and macroeconomic developments, that is, the interdependence on monetary policy on other economic variables (the policy reaction function), as well as the dependence of economic variables on monetary policy (Poddar. et al: 2006).

A good motivation for choosing to employ a VAR model is because most of the empirical literature that investigates the monetary policy transmission mechanism in different countries utilises the VAR approach. In most papers, the VAR focuses on reduced-form relationships between monetary policy and real economy variables using a small number of variables. Once estimated, VARs can be used to simulate what is known as impulse response functions of any of the variables used in the model to see how a once off shock to that variable would influence itself and other variables over time.

The mathematical representation of the reduced form VAR is:

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + e_t$$

Where y_t is a vector of k endogenous variables, c is a k×1 vector of constraints (intercept), $A_1 \ldots A_p$ are matrices of coefficients to be estimated, and e_t is a vector of innovation that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all the of the right-hand side variables. In other words, the error variables in the vector e_t have zero means, constant variances, and are individually serially uncorrelated.

The structure of the system does not incorporate contemporaneous feedback because only the lagged variables of the endogenous variables enter on the right-hand side of the equations. As a result, there will not be any problems of simultaneity. This implies that the ordinary Least Squares (OLS) yields consistent estimates.

SPECIFICATION AND PRE TESTING OF THE MODEL

I estimate the VAR model using quarterly data from 1986 Q1 to 2010 Q2. Firstly I investigate how strong the monetary transmission channels are in South Africa's current monetary policy regime i.e. the Inflation Targeting regime. Secondly I estimate two VARS over two distinct periods. The first period is the monetary targeting policy regime

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which spanned from 1986 to 1999. The second period is the inflation targeting regime which started in 2000 to the present.

The optimal lag length for the VARs estimated in both the periods was two, using the Akaike and the Schwartz criterion. The variables in the model are non-stationary, however following Sims (1980) and Sims, Stock, and Watson (1990), the variables in the VAR system should not be differenced even if they contain a unit root.

Their argument is that the goal of a VAR analysis is to determine the interrelationships among the variables, not to determine the parameter estimates. Differencing or de-trending the data throws away the co-movements in the data (such as the possibility of co-integrating relationships). The view is that the variables in a VAR system should mimic the true data generating process. The implication of estimating the model in levels is that there will be some efficiency losses, but according to Poddar. et al (2006) this does not change the consistency of the estimators. "Most of the empirical literature on VARs has tended to estimate VARs that are unrestricted in levels.

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6. VAR RESULTS

In first section of the results I assess the importance and strength of the monetary transmission variables for each channel. In the second part I assess if the monetary transmission mechanism has changed since inflation Targeting was adopted

TESTING THE DIFFERENT CHANNELS

The aim of this section is to test the strength of the monetary transmission variables during the Inflation Targeting period (2000-2010). The key question is to see whether the monetary transmission channels are operating as we would expect. In all VARS, the order of the variables remains constant and the impulse response functions are generated by a one standard deviation shock to the impulse variable in each channel.

The graphs in this section represent period-to-period impulse response functions. The horizontal axis shows the number of quarters that passed after the impulse variable is shocked. The vertical axis measures the response of the relevant variable, where a value of 0.001 corresponds to a 0.1% of the baseline value of the response variable.

The gradient of the CPI curve is interpreted as the inflation and the gradient of the GDP curve is interpreted as the Growth in GDP.

The Interest Rate Channel

We expect that a tighter monetary policy, which is represented by the positive shock to the repo, would lead to a fall in output and prices. In figure 1, we see that higher interest rates temporarily increase prices by raising the cost of financing. LCPI falls by almost 0.08% of its base value while LGDP falls by 0.04% of its base value. Therefore, the impact of a repo shock on inflation is substantially larger than on output growth.

Although a tighter monetary policy reduces both output and prices, output starts to return to its equilibrium level after just 5 quarters whereas prices take about 17 quarters.

A fall in interest rates also tends to appreciate the exchange rate, i.e. an increase in the (LREER), reduce the credit level (LCREDIT), and depress asset prices (LALSI), all respond as expected. The temporary rise in credit probably reflects duress in the business sector.

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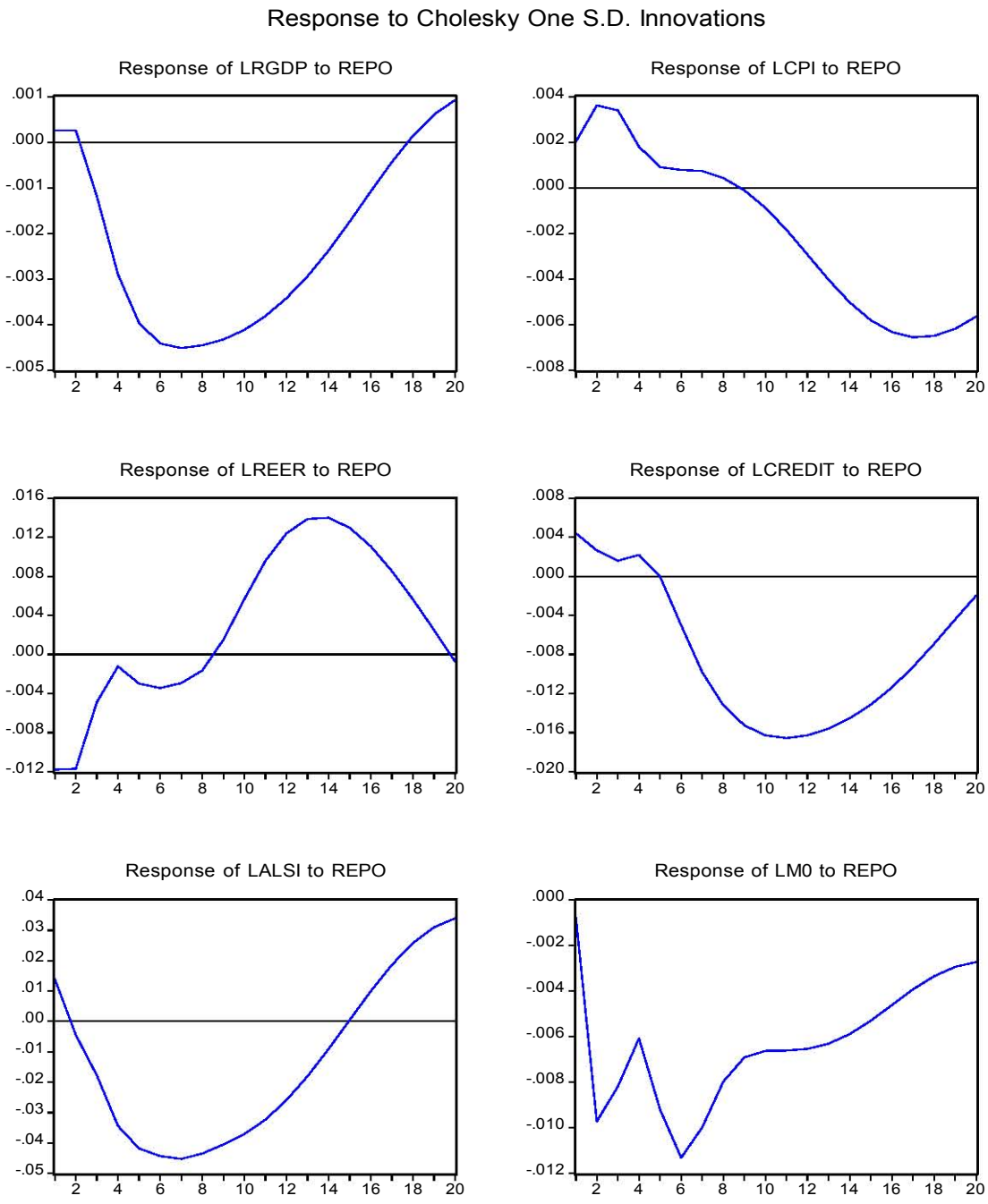
Figure 1 REPO shock



The Asset Price Channel

Figure 2 shows the impulse response functions to a one standard deviation shock to the All Share Index (LALSI), which serves as a proxy for all wealth assets. A positive shock to financial assets raises consumer prices for about 12 quarters before the prices revert back to the equilibrium level. The slope is increasing at a decreasing rate, meaning that a stock market shock has a proportionately smaller impact on inflation.

Output responds very positively to a shock in asset prices, but the impact is very short-lived, increasing for the first year and then gradually reverting back to equilibrium. I had expected a more prolonged positive impact, but this shock appears to set off a destabilizing boom bust cycle.

It is not surprising to see reserve money increase in response to a positive shock to the stock market, which may come from a domestic wealth effect, leading to a greater demand for money. The real effective exchange rate initially depreciates (declines), perhaps in response to an expected rise in inflation or a dip in the interest rate, but then it starts to appreciate ultimately leaving a stronger Rand, which is probably due to the long-run decline in CPI.

The asset price channel operates according to our a-priori expectations in the short-run but appears to create a strong medium and long-run correction, which strikes as destabilizing in the medium term. The other housing price index was also tested but it did not perform as well for a measure of asset wealth.

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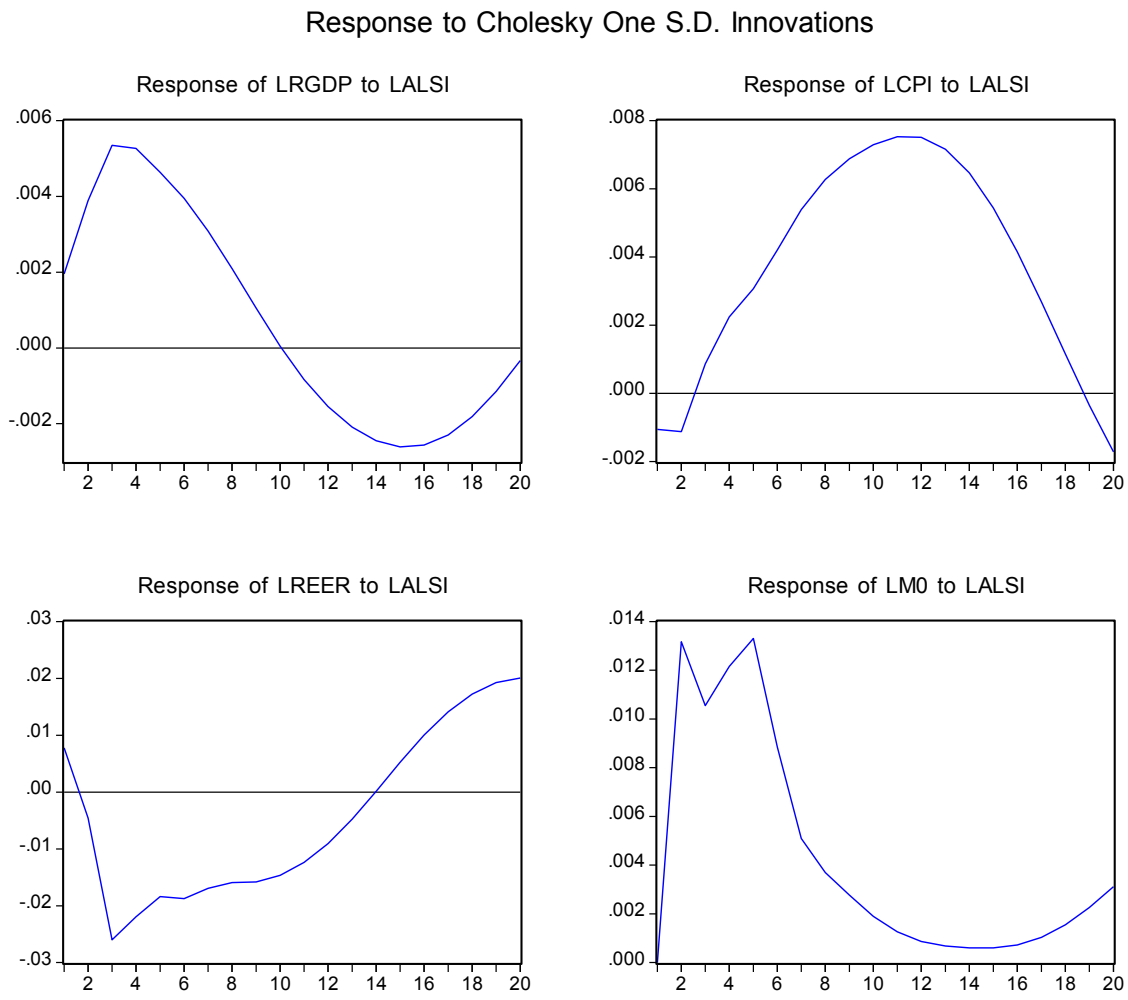
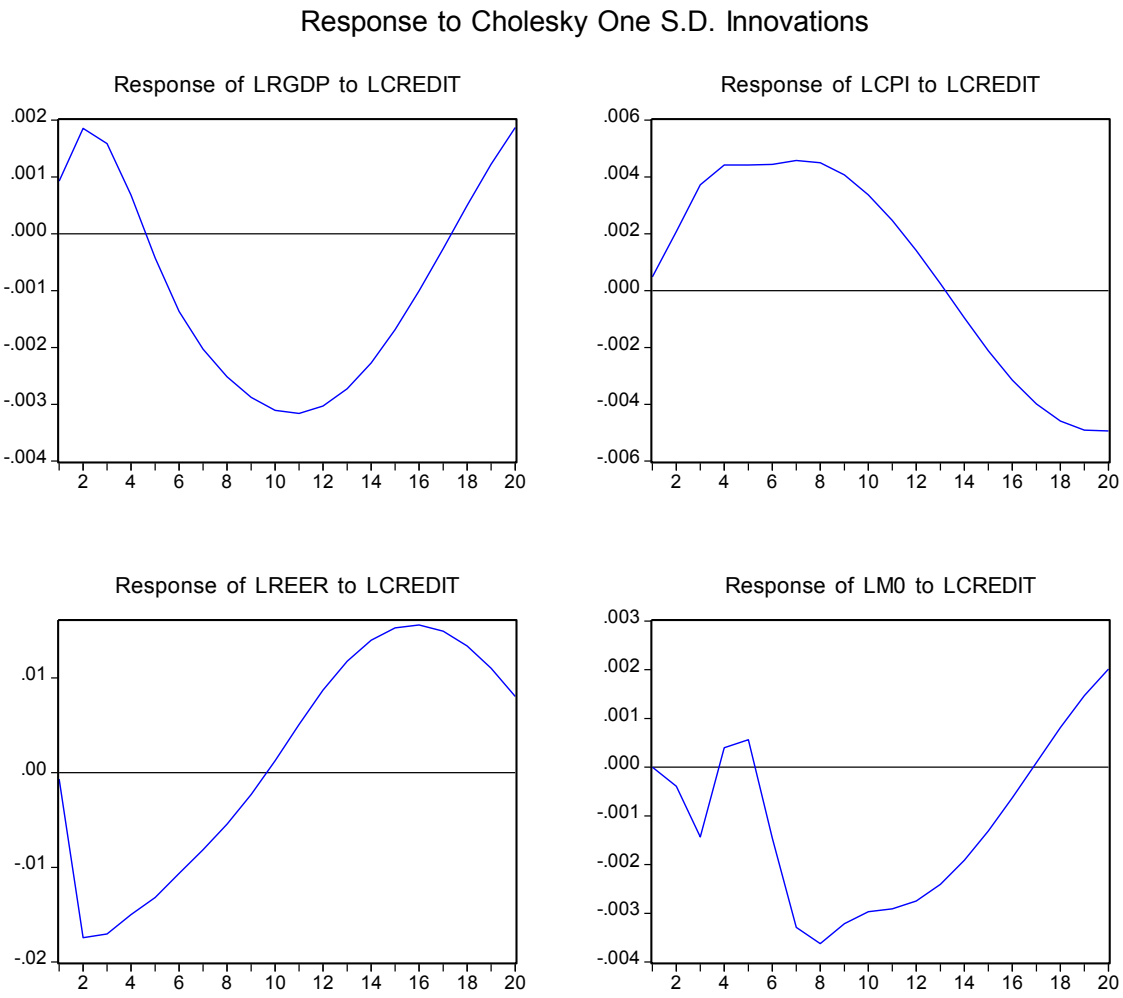
Figure 2 Equity Price Shock



The Credit Channel

We expect a positive shock to credit to raise both output and prices. This seems to be the case, but the impact is very short-lived (about 3 quarters). Thus a one time surge in credit looks like it creates an undesirable output cycle. For prices we see that it raises inflation at first and takes almost 8 quarters before a correction begins. It is uncharacteristic to see an increase in inflation that goes hand-in-hand with a fall in GDP. The credit surge leads to a depreciation of the exchange rate, probably in anticipation of a higher price level. The delayed increase in money supply may reflect the continued fall in output for 10 quarters.

Figure 3 Credit Shock

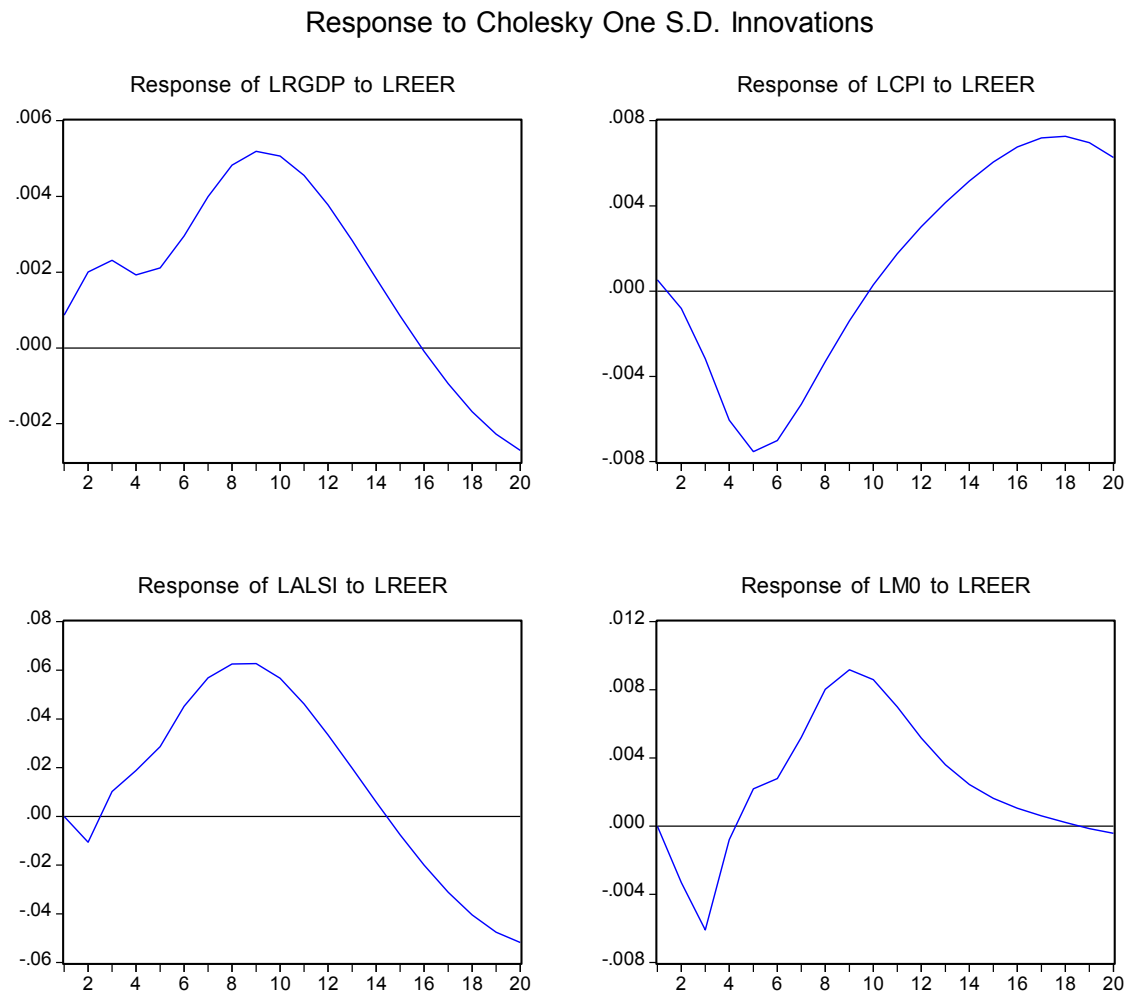


The Exchange Rate Channel

The impulse response functions to a positive shock (appreciation) to the real effective exchange rate are shown in figure 4. The strong exchange rate has the expected effect of reducing the price level and raising the value of asset prices, but has an unexpected effect of raising output. One explanation may be that a real appreciation reduces the current account balance. That is, while input prices get cheaper and real export prices raise, the corresponding quantities of imports and exports are not changing very much. A stronger exchange rate may be increasing output through the relatively lower price of inputs when the Rand appreciates.

Figure 4 Exchange Rate

Shock



TESTING THE CHANGE IN THE MONETARY TRANSMISSION MECHANISMOVERTHE TWO REGIMES

The aim of this section is to empirically test if the monetary transmission mechanism has changed since the SARB adopted an Inflation Targeting regime.

I re-estimate the previous VAR model for the (1986-1999) period and examine if the impulse-responses differ from those of the VAR estimated for the (2000-2010) period. The criterion for the comparison is made up of three factors: I compare (i) the direction of the response curves, (ii) the magnitude of the reactions and (iii) the lags involved.

Table 1 summarizes the response of CPI and GDP to shock in the repo rate, all share index, credit to the private sector and the real effective exchange rate, for each regime. To simplify the interpretation, I will refer to the Monetary Targeting Regime as the MT regime and the Inflation Targeting Regime as the IT Regime.

Results of comparison:

Repo rate shock:

Inflation: in the MT regime setting, a tighter monetary policy causes a positive shock to prices. For the first 8 quarters prices increase at a fast rate, and then start to increase at a slower rate as CPI returns back to its equilibrium level. This is not surprising because of the rational expectations theory which applies to South Africa. Prices generally increase but they never come down. The inflation rate seems to increase throughout the response period. This implies that during the MT regime, inflation was immune to a change in interest rates.

In the IT regime setting, inflation stays positive for the first nine quarters. The initial response of prices to an increase in the interest rate is to increase, due to the increase in the credit bill. After about two years, people and businesses start to realize that they have less monetary resources, and therefore expenditure goes down. Prices start to fall at an increasing rate, reflecting a decrease in the inflation rate. Therefore inflation seems to react more appropriately in the IT regime.

GDP growth: In both regimes, a decline in the repo rate causes GDP to fall. GDP falls immediately in the MT regime setting and it falls to almost 0.06% of its base value. It takes roughly two quarters before starting to fall in the IT regime setting and it falls to less than 0.05% of its base value. In terms of the GDP response, the difference between the two regimes is very small.

Equity price shock:

Inflation: in both the regimes, a shock to the all share index causes prices to increase and they continue to do so for the entire observation period. Therefore, an increase in equity prices cause inflation as expected, and the magnitude of the CPI reaction function is slightly higher in the IT regime.

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GDP growth: in the MT regime, an increase in the all share index causes the GDP to fall, which is a fall in the growth rate of GDP. This goes against our expectations. The fall in GDP is also contradictory to the fact that domestic prices increased. In the IT regime, GDP growth is positive and it lasts for about 10 quarters reflecting the increase in the wealth of individuals as stock market prices increase. The equity price channel therefore seems to work better in the IT regime setting as compared to the MT regime setting.

Credit Shock:.

Inflation: In both regimes, a shock to the credit level causes inflation to increase rapidly for the first 4 quarters, with equal magnitude. After one year, the inflation continues to increase but more gradually. The inflation rate only starts to fall after about 13 quarters.

GDP growth: in both regimes, the GDP grows for about a year and then starts to fall. In both cases the magnitude is quite small and does not really convince me that GDP reacted as we would expect. The rapid fall in GDP after just one year, may be reflecting a response by the monetary authorities. The SARB tries to control inflation by curbing the amount of credit offered to the private sector. Therefore an increase in the credit level may cause the SARB to increase interest rates. The fall in GDP may therefore be reflecting not only a possible response by the SARB, but also an indication that an interest rate shock has a much larger impact on GDP than a credit shock.

Exchange rate shock: a positive exchange rate shock should reduce net exports and therefore reduce output and prices.

Inflation: In the IT regime, a positive shock to the REER causes the inflation rate to increase. This result is very peculiar. A plausible explanation could be that during the MT regime, the exchange rate was controlled. Given that the nominal exchange rate didn't move with market forces, it is not surprising to find that prices did not react to a shock in the exchange rate. In the IT regime inflation reacts appropriately. IT falls by 0.8% of its base value and it keeps falling for over two years (9 quarters).

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GDP growth: A shock to the exchange rate causes the GDP level to fall and only start returning to the equilibrium level after 7 quarters. Therefore during the MT regime, a stronger exchange rate reduced output via a decline in net exports.

In the IT regime a shock to the exchange causes GDP to increase. As mentioned in part one of the results, it is possible that lower production input costs may be overriding the negative impact of a decline in net exports, hence causing an increase in GDP.

7. SUMMARY

The overall results seem to indicate the monetary transmission mechanism channels are stronger and more effective in the IT regime. The interest rate channel is stronger in the IT regime, based on the reaction of both output and prices. A shock to the ALSI increases both prices and output in the IT regime, but increases only prices in the MT regime. In both the regimes, the Credit channel impacts prices and output in the same way. It is therefore difficult to see in which regime the credit channel is stronger. The shock in the exchange rate is also inconclusive.

The exchange rate channel gave very mixed results in both regimes that make their comparison futile. It is worth considering that exchange rate effects are different for emerging market economies like South Africa. Particularly portfolio flows are not driven only by interest rate differentials. Other factors include growth expectations, exchange rate expectations, relative interest rate differentials, global risk appetite (so-called safe-haven effects). These various factors that affect the exchange rate work in different directions and complicate the exchange rate channel. Therefore linkages between the policy rate and the exchange rate changes in a system of large portfolio flows are unpredictable.

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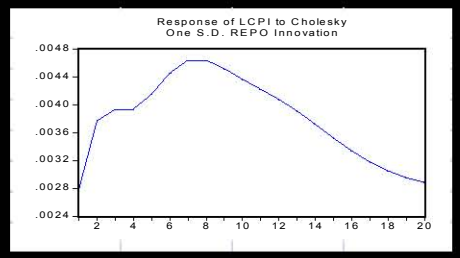
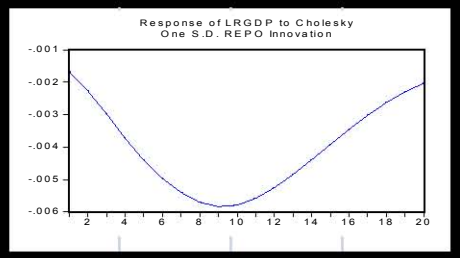
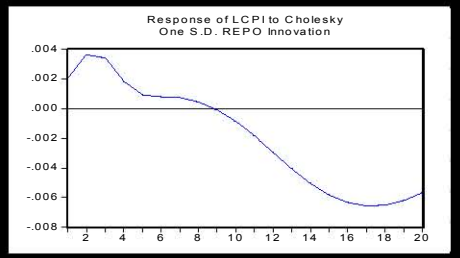
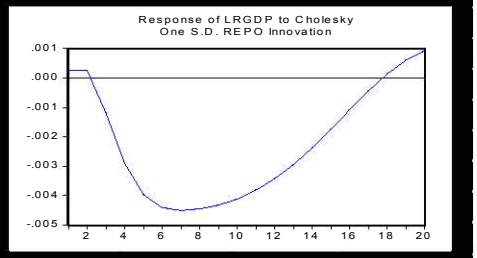
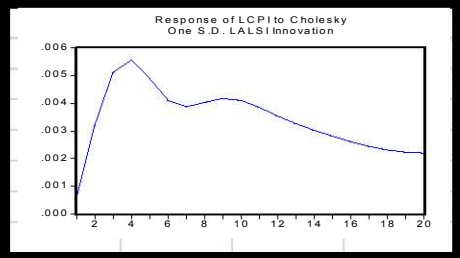
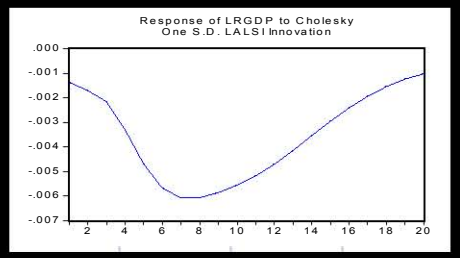
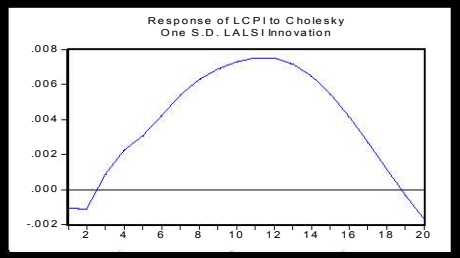
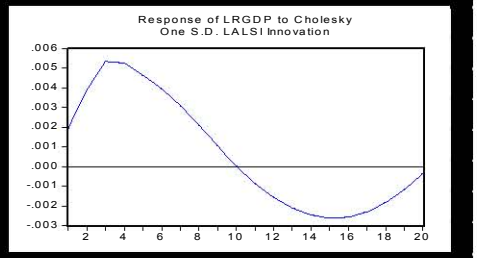
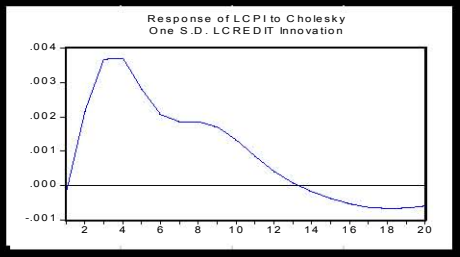
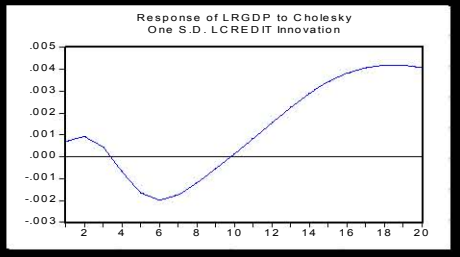
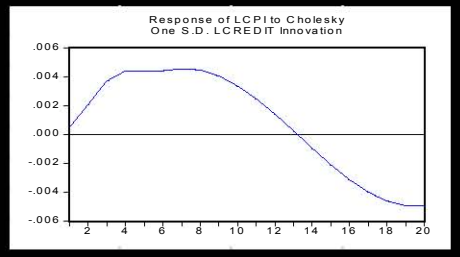
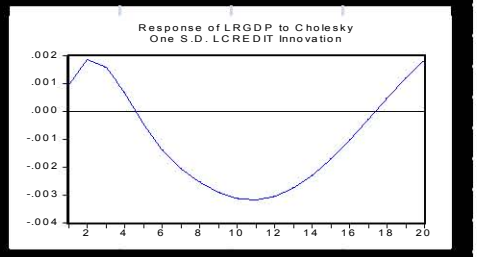
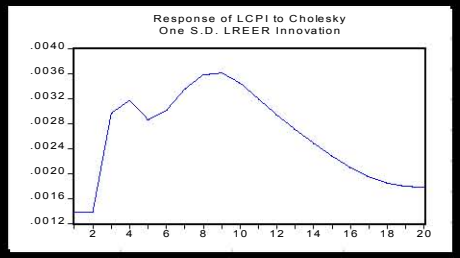
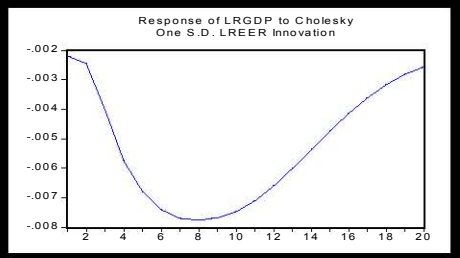
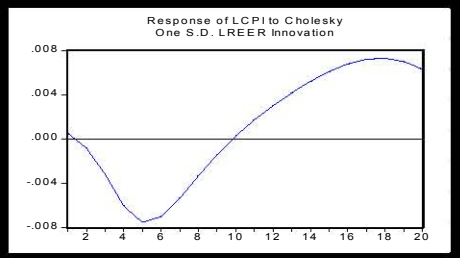
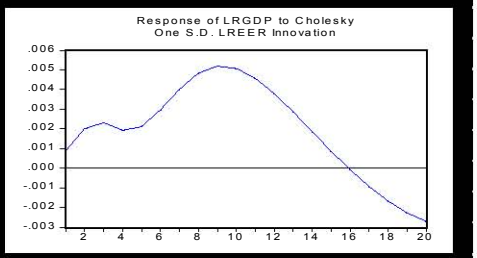
Table 1: Comparisons of channels during the different monetary policy regimes

	Monetary Targeting:1986-1999		Inflation Targeting: 2000-2010	
	CPI	**GDP**	**CPI**	**GDP**
REPO				
ALSI				
CREDIT				
REER				

8. CONCLUSION

In this paper I attempted to understand the monetary transmission mechanisms in South Africa. In the Inflation Targeting regime, the interest rate channel seems to be quite strong based on the magnitude of the reaction function and the relatively short time lags. These findings are positive in light of the fact that, the SARB's monetary policy objective is to target inflation without impeding economic growth too much. The intermediate variables; the ALSI, Credit level and the REER respond with a large negative response to a tighter monetary policy shock which is as expected. Their response time lag is also relatively short and it takes them from about 5 to 9 quarters before they start to revert back to their equilibrium levels. Reserve money falls in response to the tighter monetary policy, and then starts to return back to its equilibrium level after 6 quarters.

When comparing the two monetary policy regimes, transmission mechanisms are stronger in the Inflation Targeting regime. Output and inflation react as we would expect, to a shock in the interest rate, all share index and the credit level. The exchange rate channel gave mixed results. During some parts of the MT regime the exchange rate was controlled which may have obscured the relationship between the real effective exchange rate and prices. In the IT regime, a shock to the exchange rate has a positive impact to output, which may signal that it is working though other mechanism that overrides the net exports mechanism.

A caveat to my results, the time period of the data when separated into the two regimes becomes quite short. This might preclude any strong statements about long-run relationships between the variables.

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